S/148/60/000/009/007/025
A161/A030

The quality of steel...

starting oxidization with iron ore and oxygen after the formation of slag.
Two heats were melted with solid charge by conventional techniques, with
iron ore for oxidizing. The behaviour of nitrogen was different in the two
steel types, which may be explained by the difference in the reducing period
conditions. The conclusion was made that nitrogen content in ready steel
did not depend on the nature of the metal charge. The steel quality was
evaluated by macrostructure and mechanical properties. All ingots were
solid; the development of the transcrystallization zone did not depend on
the composition of the metal charge and oxidizers; the crystalline structure
was determined by the tapping temperature; the metal grain size was also
not affected by the nature of the charge, it was obviously determined by
the final deoxidization (both steel grades were deoxidized with aluminum).
The conclusion: steel melted from a liquid semi-product is the same as
regards its mechanical properties as steel melted from solid metal. The
mean heat time with liquid semi-product was 2 hr 05 min (or 40.7%) shorter
than with solid metal in melting ShKh15 steel, and 2 hr 02 min (45%) shorter
in melting "45" steel. The electric power consumption was reduced 37.1%
and 35.7% respectively. General conclusions: 1) Steel melted from a liquid

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The quality of steel...

S/148/60/000/009/007/025
A161/A030

semi-product is equivalent with steel melted from solid metal in the content of nonmetallic inclusions, oxygen and nitrogen and in its mechanical properties. 2) The duration of heat with liquid semi-product is nearly twice shorter, and the consumption of electric power nearly 40% lower. There are 4 figures and 3 tables.

ASSOCIATION: Moskovskiy institut stali (Moscow Steel Institute)

SUBMITTED: 20 January 1960

Card 4/4

S/148/60/000/011/002/015
A161/A030

AUTHORS: Chernyakov, V. A.; Samarin, A. M.

TITLE: Desulfuration of liquid metal with slag in vacuum treatment

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Chernaya metallurgiya,
               no. 11, 1960, 32 - 35

TEXT: Information is given on laboratory experiments at the Moscow
Steel Institute. It is said in a brief introductory review that the slag
treatment idea came from Engineer A. S. Tochinskiy (in 1925), was later
developed abroad by Zhiro and Perren (Russian spelling) (Ref. 2: M. I.
Aronovich and Ye. B. Kostyuchenko, book, "Development of slag treatment
method abroad", 1936), and that in the USSR the Verkh-Isetskiy zavod (Ver-
khniy-Iset Works) desulfurized transformer steel with powder slag composed
of 80 % freshly roasted lime and 20 % fluorspar during tapping (using 1.2 -
1.1 % slag mass, in weight per cent, and achieving S content reduction to
0.011 % from 0.022) transformer steel melted in an open-hearth furnace was
treated with slag mixture of 83 % lime, 12 % fluorspar and 5 % soda, which
proved three times more effective than treatment with furnace slag during

Card 1/2

Desulfuration of liquid metal .....

S/148/60/000/011/002/015
A161/A030

tapping (Ref. 5: N.F. Dubrov and A.I. Korin, Stal', 1956, No. 1). Vacuum
treatment in a ladle is now coming into use. The Moscow Steel Institute
experimented in a laboratory where vacuum treatment in a ladle was not
possible; the equipment comprised a 40-kg induction vacuum furnace with a
magnesite crucible. Liquid slag was prepared in a graphite crucible within
an induction furnace. Slags selected in preliminary experiments were: 1)
80 % lime with 20 % fluorspar, and 2) 50 % lime and 50 % alumina. A slag
mixture of lime and fluorspar was then heated to 800°C and put on the metal
surface, and the lime-alumina mixture was melted and poured onto the metal.
Conclusions: 1) Ten minutes treatment in vacuum with slag of lime with
fluorspar reduces S content in steel 80 %; 2) same treatment with lime-alu-
mina slag reduces S content 45 %; 3) The proper quantity of lime-alumina
slag is 2 - 4 % of the weight of the metal. There are 3 tables and 5 Soviet
references.

ASSOCIATION: Moskovskiy institut stali (Moscow Steel Institute)

SUBMITTED: July 5, 1960.

Card 2/2

SAMARIN, A.M.; LUKASHEVICH-DUVANOVA, Yu.T.; DIMANT, O.V.

Determination of nonmetallic inclusions in niobium and zirconium.
Trudy Kom. anal. khim. 12:94-107 '60.   (MIRA 13:8)
        (Niobium—Analysis)   (Zirconium—Analysis)
                (Nonmetallic minerals)

NIKOLAJENKO,E.; SZAMARIN,A.; BURAKOV,Sz.

Die casting of castings modified by magnesium. Musz elet 15 no.6:10 '60.   (KEAI 9:6)

(Steel)   (Magnesium)

SAMARIN, A.M.; MCHEDLISHVILI, V.A.; LYUBIMOVA, G.A.

Effect of the thermal treatment on the processes of anodic solution of ball-bearing steel. Zav.lab. 26 no.9:1052-1055 '60. (MIRA 13:9)

1. Institut metallurgii im. A.A.Baykova Akademii nauk SSSR.
           (Steel--Heat treatment)
           (Steel--Analysis)

S/032/60/026/011/006/035
B015/B066

AUTHORS: Mchedlishvili, V. A., Lyubimova, G. A., and Samarin, A. M.

TITLE: Method of Electrolytic Dissolution of Stainless Steel

PERIODICAL: Zavodskaya laboratoriya, 1960, Vol. 26, No. 11,
              pp. 1212-1219

TEXT: The methods described in publications (Refs. 1-4) for electrolytic
dissolution of stainless steel and high-chromium steels for isolating
carbides and nonmetallic inclusions are inappropriate. When checking the
method of N. A. Saverina (Ref. 2) N. M. Popova, A. F. Platonova, and
K. P. Leonova (Ref. 5) found that at high current densities a dissolution
of the carbides and a considerable contamination of the anode deposits
occur. The authors of the present paper checked the methods of Refs. 1
and 2 for the isolation of oxide/inclusions in steels of the 1X18H9
(1Kh18N9) and 1X18H9T (1Kh18N9T) types and also noted that the anode
deposits were appreciably contaminated. They further studied the
electrolytic method devised by Klinger and Koch (Refs. 6,8) on an

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Method of Electrolytic Dissolution of   S/032/60/026/011/006/035
Stainless Steel   B015/B066

electrolyzer of simpler design, and determined the optimum compositions
of the catholyte and the anolyte as well as the operational conditions.
The most suitable current density was found to be at 0.03 - 0.05 a/cm^2,
if a neutral anolyte with 5% KCNS + 1% sodium citrate + 0.08% As_2O_3 and a
catholyte consisting of 5% sodium citrate acidified with citric acid to
give a pH = 2.5 - 3 are used in the flow-system. Under these conditions
a uniform dissolution of the steel sample is attained and no by-products
are formed. A good isolation of the carbide fraction is achieved. The
X-ray structure analysis of the carbide deposit of the two steels
mentioned above shows that they consist of $(Cr, Fe)_{23}C_6$ and/or carbides
enriched in titanium. A chemical analysis of the oxide inclusions
obtained from an anode deposit of 1Kh18N9 steel which had been treated
with chlorine, shows that mainly SiO_2 and Al_2O_3 occur which is in
agreement with the results of the vacuum melting. There are 5 figures,
3 tables, and 12 references: 8 Soviet and 4 German.

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR
               (Institute of Metallurgy imeni A. A. Baykov of the Academy
               of Sciences of the USSR)

Card 2/2

S/020/60/132/03/23/066
B014/B011

AUTHORS: Vertman, A. A., Samarin, A. M., Corresponding Member
             of the AS USSR

TITLE: Viscosity of Liquid Nickel and Its Copper Alloys

TEXT: By way of introduction, the authors state that there are few
publications available so far on the behavior of alloys in the liquid
state that give rise to solid solutions. Reference is made in this con-
nection to a paper by F. Gaybullayev (Ref. 1), who investigated the elec-
trical conductivity of systems Ag-Au, In-Pb, and Bi-Sb. As was found
there, the form of the isotherms of electrical conductivity does not
differ from the one applying to solid solutions. Reference is further
made to papers by K. Hondo and H. Endo (Ref. 2), who investigated the
magnetic susceptibility of bismuth alloys with antimony in the tem-
perature range of 20-680°C. These authors showed that the change of
the isothermal magnetic susceptibility in dependence of concentration
proceeds in a linear manner. The authors of the article under review

Card 1/3

Viscosity of Liquid Nickel and Its
Copper Alloys

S/020/60/132/03/23/066
B014/B011

obtained a similar result for system Ni-Co (Ref. 3). Other articles
(Refs. 4-6) showed the unlimited reciprocal solubility in the systems
Au-Ag, Cu-Au, and Bi-Sb in the liquid state as well. The authors of
the present paper studied the viscosity of system Ni-Cu in a high-
temperature viscosimeter in helium atmosphere. The temperatures were
measured with a Pt-PtRh thermoelement. Measurement results are shown
in Table 1 and in the three diagrams (Figs. 1-3). It may be observed
from Fig. 1 that the isothermal viscosity for temperatures 1500 and
1600°C proceeds in an almost linear manner. Fig. 2 is a graphic re-
presentation of the logarithm of the kinematic viscosity $\log \nu$ in de-
pendence of $10^{-3}/T$. Experimental data can be described here by the
relation $\log \nu = A/T + B$ (A, B are constant). The identity of the part
played by nickel and copper atoms in the transmission of pulses may be
observed from the results. With reference to an anomaly in the tempera-
ture dependence of the viscosity of nickel pointed out by D. K.
Belashchenko, this anomaly is brought into connection with the desoxi-
dizing action of the hydrogen in which measurements were made. This
is said to have given rise to a reduction of solved oxygen content
in nickel, which in its turn influences viscosity. The authors under-

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Viscosity of Liquid Nickel and Its   S/020/60/132/03/23/066
Copper Alloys   B014/B011

took experiments to check this assumption. Results are graphically de-
picted in Fig. 3. No anomaly in viscosity was detected. Finally, data
concerning viscosity are given for practical purposes. Thus, nickel
has a dynamic viscosity of 0.0410 poise at 1500°C. There are 3 figures,
1 table, and 13 references, 8 of which are Soviet.

ASSOCIATION: Institut metallurgii Akademii nauk SSSR
                (Institute of Metallurgy of the Academy of Sciences,
                USSR)

SUBMITTED: February 5, 1960

Card 3/3

VERTMAN, A.A.; SAMARIN, A.M.

Magnetic susceptibility of nickel, cobalt, and iron at high
temperatures in the liquid state. Dokl.AN SSSR 134 no.2:
326-329 S '60.   (MIRA 13:9)

1. Institut metallurgii im. A.A. Baykova Akademii nauk SSSR.
2. Chlen-korrespondent AN SSSR (for Samarin).
            (Nickel--Magnetic properties)
            (Cobalt--Magnetic properties)
            (Iron--Magnetic properties)
            (Liquid metals--Magnetic properties)

83904

S/020/60/134/003/018/020
B004/B067

18.9200 only 2308

AUTHORS: Vertman, A. A., and Samarin, A. M., Corresponding Member
of the AS USSR

TITLE: The State of Carbon in Liquid Cast Iron

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 134, No. 3,
pp. 629-631

TEXT: For determining the configuration of carbon in cast iron the
authors centrifuged samples of liquid cast iron. The number of revolutions
of the centrifuge was 1700-1900/min, acceleration was 320 g, and the
duration of experiments was 1230-1275 min. The temperature was approxi-
mately 30-50°C above the melting point, and was kept constant at ±5°C
by means of a Pt-PtRh thermocouple and an ЭПП-09 (EPP-09) electronic
potentiometer. After the samples had been centrifuged, they were quenched
in water and analyzed. As is shown by table 1, the centrifugal force
causes an irregular distribution of carbon in the sample. Those parts of
the sample which were nearer the rotational axis were enriched with C.
From the angular velocity, the molecular weight of C and Fe, the

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The State of Carbon in Liquid Cast Iron

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B004/B067

difference between their densities, the initial concentration, the distance from the rotational axis, and from the temperature, the authors calculated the number of carbon particles in the liquid cast iron to be $2.5 \cdot 10^7$, the volume of the carbon colonies to be approximately $50 \cdot 10^{-18}$ cm^3, and the particle diameter to be of the order of 10^{-6} cm, which corresponds to a colloidal, disperse system. They concluded therefrom that cast iron is a microheterogeneous system which is not in equilibrium, consisting of carbon-saturated iron and of carbon-saturated colonies. The authors mention papers by K. P. Bunin (Ref. 1), S. T. Konobeyevskiy (Ref. 3), and D. P. Ivanov (Ref. 2). There are 1 table and 8 Soviet references.

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR (Institute of Metallurgy imeni A. A. Baykov of the Academy of Sciences USSR)

SUBMITTED: May 20, 1960

Card 2/2

SAMARIN, A.M., otv. red.; ZOLOTOV, P.F., red. izd-va; KASHINA, P.S., tekhn. red.; SHEVCHENKO, G.N., tekhn. red.

[Ingots and the properties of steel] Slitok i svoistva stali; trudy. Moskva, Izd-vo Akad.nauk SSSR, 1961. 177 p.
(MIRA 15:1)

1. Konferentsiya po fiziko-khimicheskim osnovam proizvodstva stali. 5th, Moscow, 1959. 2. Chlen-korrespondent AN SSSR (for Samarin).

(Steel ingots)

SAMARIN, A. M.

8J

PHASE I BOOK EXPLOITATION   SOV/5556

Moscow. Institut stali.

Novoye v teorii i praktike proizvodstva martenovskoy stali (New [Developments]
in the Theory and Practice of Open-Hearth Steelmaking) Moscow, Metallurgizdat,
1961. 439 p. (Series: Trudy Mezhvuzovskogo nauchnogo soveshchaniya)
2,150 copies printed.

Sponsoring Agency: Ministerstvo vysshego i srednego spetsial'nogo obrazovaniya
RSFSR. Moskovskiy institut stali imeni I. V. Stalina.

Eds.: M. A. Glinkov, Professor, Doctor of Technical Sciences, V. V. Kondakov,
Professor, Doctor of Technical Sciences, V. A. Kudrin, Docent, Candidate of
Technical Sciences, G. N. Oyks, Professor, Doctor of Technical Sciences,
and V. I. Yavoyskiy, Professor, Doctor of Technical Sciences; Ed.: Ye. A.
Borko; Ed. of Publishing House: N. D. Gromov; Tech. Ed.: A. I. Karasev.

PURPOSE: This collection of articles is intended for members of scientific
institutions, faculty members of schools of higher education, engineers
concerned with metallurgical processes and physical chemistry, and students
specializing in these fields.

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New [Developments] in the Theory (Cont.)   SOV/5556

COVERAGE: The collection contains papers reviewing the development of open-
hearth steelmaking theory and practice. The papers, written by staff
members of schools of higher education, scientific research institutes,
and main laboratories of metallurgical plants, were presented and discussed
at the Scientific Conference of Schools of Higher Education. The following
topics are considered: the kinetics and mechanism of carbon oxidation; the
process of slag formation in open-hearth furnaces using in the charge either
ore-lime briquets or composite flux (the product of calcining the mixture of
lime with bauxite); the behavior of hydrogen in the open-hearth bath; metal
desulfurization processes; the control of the open-hearth thermal melting
regime and its automation; heat-engineering problems in large-capacity
furnaces; aerodynamic properties of fuel gases and their flow in the furnace
combustion chamber; and the improvement of high-alloy steel quality through
the utilization of vacuum and natural gases. The following persons took
part in the discussion of the papers at the Conference: S.I. Filippov,
V.A. Kudrin, M.A. Glinkov, B.P. Nam, V.I. Yavoyskiy, G.N. Oyks and Ye.
V. Chelishchev (Moscow Steel Institute); Ye. A. Kazachkov and A. S.
Kharitonov (Zhdanov Metallurgical Institute); N.S. Mikhaylets(Institute of
Chemical Metallurgy of the Siberian Branch of the Academy of Sciences USSR);
A.I. Stroganov and D. Ya. Povolotskiy (Chelyabinsk Polytechnic Institute);
P.V. Umrikhin (Ural Polytechnic Institute); I.I. Fomin (the Moscow "Serp i
molot" Metallurgical Plant); V.A. Fuklev (Central Asian Polytechnic Institute)

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New [Developments] in the Theory (Cont.)   SOV/5556

and M.I. Beylinov (Night School of the Dneprodzerzhinsk Metallurgical Institute).
References follow some of the articles. There are 268 references, mostly Soviet.

TABLE OF CONTENTS: 5

Foreword

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New [Developments]in the Theory (Cont.)   SOV/5556

Perchatkin, P.N. [Engineer], A.A. Bezdenezhnykh [Docent, Candidate
of Technical Sciences], A.M. Bigeyev [Docent, Candidate of Technical
Sciences], and V.N. Letizin [Engineer], [Magnitogorsk Mining and
Metallurgical Institute]. Effect of Furnace Atmosphere on the
Behavior of Sulfur During Melting in the High-Capacity Open-Hearth
Furnace   361

Ivanov, R.M. [Candidate of Technical Sciences], Ye. V. Abrosimov
[Moscow Steel Institute]. Temperature Regime of the Oxygen-Blown
Open-Hearth Bath   371

Samarin, A.M. [Corresponding Member of the Academy of Sciences USSR],
and A.P. Potrusayev [Engineer], [Moscow Steel Institute].
Change in Metal Composition Caused by Oxygen Blowing   379

Piklev, V.A. [Docent, Candidate of Technical Sciences, Sredneaziatskiy
politekhnicheskiy institut - Central Asia Polytechnic Institute].
Desiliconizing Pig Iron by Oxygen in a Special Spout While Pouring
Iron Into the Open-Hearth Furnace   388

Card 13/14

SAMARIN, A·M

PHASE I BOOK EXPLOITATION   SOV/5411

Konferentsiya po fiziko-khimicheskim osnovam proizvodstva stali. 5th,
   Moscow, 1959.

Fiziko-khimicheskiye osnovy proizvodstva stali; trudy konferentsii
   (Physicochemical Bases of Steel Making; Transactions of the
   Fifth Conference on the Physicochemical Bases of Steelmaking)
   Moscow, Metallurgizdat, 1961. 512 p. Errata slip inserted.
   3,700 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Institut metallurgii imeni
   A. A. Baykova.

Responsible Ed.: A. M. Samarin, Corresponding Member, Academy
   of Sciences USSR; Ed. of Publishing House: Ya. D. Rozentsveyg.
   Tech. Ed.: V. V. Mikhaylova.

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SOV/5411

Physicochemical Bases of (Cont.)

PURPOSE: This collection of articles is intended for engineers and technicians of metallurgical and machine-building plants, senior students of schools of higher education, staff members of design bureaus and planning institutes, and scientific research workers.

COVERAGE: The collection contains reports presented at the fifth annual convention devoted to the review of the physicochemical bases of the steelmaking process. These reports deal with problems of the mechanism and kinetics of reactions taking place in the molten metal in steelmaking furnaces. The following are also discussed: problems involved in the production of alloyed steel, the structure of the ingot, the mechanism of solidification, and the converter steelmaking process. The articles contain conclusions drawn from the results of experimental studies, and are accompanied by references of which most are Soviet.

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Physicochemical Bases of (Cont.)   SOV/5411

PART III. NONMETALLIC INCLUSIONS AND
THE PROPERTIES OF STEEL

Card 12 /16

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Physicochemical Bases of (Cont.)   SOV/5411

Card 14/16

LOMONOSOV, Mikhail Vasil'yevich; TOPCHIYEV, A.V., akad., red.; PETROVSKIY, I.G., akad., red.; ANDREYEV, P.N., akad., red.; BYKOV, K.M., akad.,red.; KAZANSKIY, V.A., akad., red.; SHMIDT, O.Yu., akad., red.; SHCHERBAKOV, D.I., akad., red.; YUDIN, P.F., akad., red.; DELONE, B.N., red.; KOSH-TOYANTS, Kh.S., red.; SAMARIN, A.M., red.; LEBEDEV, D.M., prof., red.; FIGUROVSKIY, N.A., prof., red.; KUZNETSOV, I.V., kand. filos. nauk, red.; BERKOVICH, D.M., red. izd-va; NOVICHKOVA, N.D., tekhn. red.; KASHINA, P.Ye., tekhn. red.

[Selected works in chemistry and physics] Izbrannye trudy po khimii i fizike. Red.A.V.Topchieva. Stat'ia N.A.Figurovskogo. Primechaniia G.A.Andreevoi, O.A.Lezhnevoi i N.A.Figurovskogo. Moskva, Izd-vo Akad. nauk SSSR, 1961. 560 p.

(MIRA 14:11)

1. Chlen-korrespondent AN SSSR (for Delone, Koshtoyants, Samarin).
                (Lomonosov, Mikhail Vasil'evich, 1711-1765)
                (Chemistry)   (Physics)

AUTHORS: Averin, V. V., Samarin, A. M.

TITLE: On the complex deoxidation of steel and alloys

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 4, 1962, 15, abstract 4A76
             (V sb. "Fiz.-khim. osnovy proiz-va stali", Moscow, AN SSSR, 1961,
             18 - 26)

TEXT: The authors analyze thermodynamical conditions of O dissolving in
alloys in the presence of some deoxidizing elements, having a greater chemical
affinity to O than the base metal. On the basis of experimental and literature
data, a graph is plotted and analyzed; it shows the relationship between the
strength of the oxide of the given deoxidizing element, evaluated from the dif-
ference in the partial pressure of the given oxide and liquid FeO, and concentra-
tion ratio N_{Fe}/N_{Me} in the alloy corresponding to the appearance of a pure deoxi-
dizing oxide in an equilibrium with the alloy. The solubility of O in the Fe-
Cr-Si system is analyzed. In low-chromium alloys Si promotes a fuller elimina-
tion of O as compared with Fe-Si alloys. At a content of $Si > 1\%$ the introduc-

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S/137/62/000/004/006/201
A006/A101

On the complex deoxidation of steel and alloys

tion of Cr into the metal can not reduce the solubility of O in the alloys, since the affinity to O of these alloys is greater than that of Cr. The authors discuss the joint effect of Mn and Si, Mn and Al, on O solubility in Fe. A diagram is plotted showing the deoxidation of Fe-Si alloys with Al, Ti, V, Mn, Cr. On the basis of an analysis of literature data, the cause was revealed of a sharper decrease of O concentration under the effect of complex deoxidizers as compared to deoxidation of steel with plain deoxidizers.

B. Linchevskiy

[Abstracter's note: Complete translation]

Card 2/2

36421
S/137/62/000/003/005/191
A006/A101

/P. 115)

AUTHORS: Glinenyy, Ya., Averin, V. V., Samarin, A. M.

TITLE: The effect of aluminum and titanium on oxygen solubility in an iron-
             chrome alloy (18% Cr)

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 3, 1962, 10, abstract 3A60
             (V sb. "Fiz-khim. osnovy proiz-va stali", Moscow, AN SSSR, 1961,
             27-32)

TEXT: Tests were run with electrolytic Fe, Cr, Al and sponge Ti. Heats
with Al were carried out in chemically pure corundum crucibles, and with Ti in
zircon-crucibles. Samples were drawn-off into quartz tubes. The O content was
determined by the method of vacuum melting, the Al content by the calorimetric
or weight method, and the Ti content by the calorimetric method. The effect of
Al and Ti on the O solubility in a Fe-Cr alloy (18% Cr) at 1,600°C was studied
by establishing the equilibrium in the following system: metal-oxide phase -
H_2-H_2O gas mixture with a given oxidizing potential. The authors evaluated the
deoxidizing capacity of the deoxidizing elements in the alloy investigated, which
corresponds to the difference in the partial energy values of O dissolving in

Card 1/2

The effect of aluminum ...

S/137/62/000/003/005/191
A006/A101

the initial alloy and the deoxidizing element. Al and Ti are effective deoxidizers for the alloy investigated; Si and Mn reduce the solubility of O to a considerably lower degree. Mn, in spite of its low deoxidizing capacity, reduces the content of O dissolved in the alloy investigated; this should be taken into account when replacing Ni by Mn in the given steel grades. The joint effect of Si and Ti at low concentration of the latter, causes additional decrease of the O content as compared with an alloy that was deoxidized with Ti only.

T. Kolesnikova

[Abstracter's note: Complete translation]

Card 2/2

S/137/62/000/005/002/150
A006/A101

AUTHORS: Wang Ching-t'ang, Karasev, R. A., Samarin, A. M.

TITLE: The effect of impurities on surface tension of pure iron

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 5, 1962, 8, abstract 5A47
             (V sb."Fiz.-khim. osnovy proiz-va stali", Moscow, AN SSSR, 1961,
             106-111)

TEXT: The authors employed the method of taking photographs of a lying
drop on a processed alumina backing at steel founding temperatures in purified
He atmosphere to investigate σ_{Fe}, containing (in %): O 0.001, C 0.001 - 0.002,
S 0.002, N < 0.002, Cu and Ni - traces; and the effect upon σ_{Fe} of C and O.
σ_{Fe} at 1,550°C is 1,865 dyne/cm. Temperature coefficient σ_{Fe} dσ/dt = - 0.49
dyne/cm. degree. At 1,550°C C has no particular effect on σ_{Fe}. With a higher
C content, raised from 0.002 to 4.15%, σ decreases from 1,865 to 1,788 dyne/cm.
With an O content, increased from 0.001 to 0.184%, σ decreases from 1,865 to
1,056 dyne/cm. Maximum O adsorption is 23.4 · 10^{-10} mole/cm^2 at an O content of
about 0.05%. The hypothesis is advanced, that there is a mixture of FeO and O
ions in the surface layer, FeO being prevalent.
[Abstracter's note: Complete translation]   T. Kolesnikova
Card 1/1

32597
S/137/61/000/011/026/123
A060/A101

18.3200

AUTHORS: Samarin, A.M., Potrusayev, A.P.

TITLE: Change in the metal composition under oxygen blow-through

PERIODICAL: Referativnyy zhurnal. Metallurgiya, no. 11, 1961, 47, abstract
              11V269 (V sb. "Novoye v teorii i praktike proiz-va martenovsk.stali",
              Moscow, Metallurgizdat, 1961, 379-387, Discuss. 428 - 439)

TEXT: The metal was blown-through in high-frequency furnaces with 10 and
40 kg capacity, and in an experimental 350 kg converter with basic fettling. In
the course of the first 5 minutes the Si is oxidized down to traces, Mn by 80%.
The oxidation rate of the carbon content at constant O_2 feed rate is not uniform.
At the beginning of the blow-through it constitutes 0.2-0.3% C/min and as the
blowing continues it grows to 0.25-0.45% carbon/min, and at the end of the blow-
through a drop in the decarbonization rate down to 0.1-0.3 % C/min is observed.
The effect of O_2 feed rate and the distance between the tuyere and the vat surface
upon the sequence and oxidation rates of C content and P content at the end of
the blow through was studied in the 40 kg furnace. The rate of O_2 supply varied
between 100 and 150 liters/min, and the tuyere distance - between 25 and 40 mm.

Card 1/2

Change in the metal composition ...

As the tuyere distance is increased and the O_2 supply rate is decreased, the V_C is decreased. At an oxygen expenditure of 150 liters per minute and additions of ore it was managed to finish the dephosphorization during the time of C oxidation. A reduction in the O_2 expenditure or an increase of the distance between the tuyere and the metal at the end of the decarbonization process leads to raising of the content of iron oxides in the slag, and the V_c is decreased, while the V_p is somewhat increased. After the loading of 50% of the lime and ore, the vat was blown through with O_2. After 3 - 6 min of the blow-through the P was oxidized by 93 - 94%, C by 14.6 - 33.5%, S by 22.6 - 28%. It was established that as the lump dimensions of the lime are increased, the P content in the metal increases.

Yu. Nechkin

[Abstracter's note: Complete translation]

Card 2/2

POLYAKOV, A.Yu.; SAMARIN, A.M.; SYUY TSZEN-TSZI [Hsü TSeng-chi]

Investigating the activity of components of liquid binary alloys
in the system iron - silicon. Izv. vys. ucheb. zav.; chern. met.
no. 1:12-20 '61.   (MIRA 14:2)

1. Institut metallurgii AN SSSR i Moskovskiy institut stali.
        (Iron-silicon alloys)   (Activity coefficients)

VAN TSZIN-TAN [Wang Cing-t'ang] (Moskva); KALASEV, R.A. (Moskva); SAKARIN, A.M. (Moskva); SMALIDEV, A.J. (Moskva)

Surface tension of molten iron – sulfur – carbon, iron – manganese – sulfur, iron – manganese – carbon. Izv. AN SSSR. Otd. tekh. nauk. Met. i topl. no.1:15-19 Ja-F '61. (MIRA 14:2)
(Surface tension) (Liquid metals)

18.8100   1138, 1418, 1413

20266
S/180/61/000/002/006/012
E073/E535

AUTHORS: Vertman, A.A. and Samarin, A.M. (Moscow)

TITLE: Properties of Liquid Alloys with Unlimited Solubility
of the Components in the Solid State

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh
nauk, Metallurgiya i toplivo, 1961, No.2, pp.83-87

TEXT: In measuring the electric conductivities of the systems
Ag-Au and Bi-Sb, F. Gaybullayev ("Investigation of the electric
conductivity of atomary solutions and eutectics in the liquid state",
Dissertation, 1958, Leningrad Pedagogic Institute) found that the
electric conductivity isotherms of liquid alloys do not differ from
the corresponding curves pertaining to solid solutions: with
increasing temperature the minimum which is characteristic on the
curve for solid solutions flattens out and the dependence of the
electric conductivity on the composition approaches the linear
dependence.   This was explained by the fact that scattering of the
electron wave on account of the thermal oscillations becomes
predominant as compared to the difference in the scattering ability
of the components.   A brief review of the work of other authors

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Properties of Liquid Alloys ...

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shows that so far only relatively low melting point systems were studied and, therefore, it was interesting to supplement the knowledge on the properties of liquid alloys of systems with unlimited solubility of the components in the solid state by studying alloys with high melting point components and, therefore, the systems Ni-Cu and Ni-Co were studied. The viscosity and the electric conductivity were measured by means of equipment described in an earlier paper (Ref.7) in a helium atmosphere. The temperature was measured by a platinum-platinum rhodium thermocouple placed directly under the crucible. The alloys were prepared by smelting under a vacuum of 10^{-2} mm Hg.   The measured viscosity values are plotted in Fig.1a for Ni-Cu alloys and in Fig.1b for Ni-Co alloys in terms of $\nu \cdot 10^3$ centistokes vs. wt.% (Cu,Co). The values given were measured at the following temperatures: 1 - 1500°C, 2 - 1600°C, 3 - 1525°C, 4 - extrapolated values. The temperature dependence of the viscosity of the investigated alloys was slight. The experimental values obtained on the dependence of the logarithm of the kinematic viscosity, lg ν, of Ni and Cu on the inverse temperature are in good agreement with an equation of the type

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Properties of Liquid Alloys ...

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$$\vartheta = K \exp \frac{E}{RT}, \qquad \log \vartheta = \frac{A}{T} + B$$

where A, B and K are constants, E is the activation energy for viscous flow. The measured values of the electric conductivity are given in Fig.3a for Ni-Cu alloys, in Fig.3b for Ni-Co alloys, $\sigma \times 10^4$ ohm^{-1}, cm^{-1} vs. wt.% of Cu and Co, respectively. The measured values 1 were obtained for 1300°C, 2 - 1500°C, 3 -1600°C. The results are similar to those characteristic for solid solutions. However, in solid solutions the conductivity is determined basic- ally by the differing ability of the atoms of each type to scatter electron waves, whilst in the liquid state the conductivity is mainly determined by the scattering caused by thermal oscillations. The difference in the electron structure of the atoms manifests itself also in the measured values of the magnetic properties of melts.   Fig.4 shows the isotherm of the susceptibility, $\varkappa_o$, in relative units, of liquid Ni-Co alloys. The experiments were carried out in a test-rig with electromagnetic scales inside an argon atmosphere using a field of 4000 Oe.   The weight of the specimens did not exceed 2 g, the weighing accuracy was $\pm$ 0.1 mg.

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Properties of Liquid Alloys ...   S/180/61/000/002/006/012
                                   EO73/E535

The same figure also contains values of the average magnetic
moment of the nucleus determined by the average number of vacancies
in the inner electron shell of the atoms in Ni-Co system alloys
(data quoted from the work of Bozorth). The measurements were made
at 1600°C. Calculated values of the concentration dependence of
the changes in the free energy of viscous flow in liquid Ni-Cu
alloys at 1500°C (1) and Ni-Co 1525°C (2) are plotted in Fig.5.
In both cases there are slight negative deviations attributed to
the difference in the electron structure and to s-d-interaction.
This result confirms the results obtained by O. A. Yesin and his
team (Ref.10) in investigating liquid Ni-Cu alloys by the e.m.f.
method.   There are 5 figures, 5 tables and 10 references:
3 Soviet and 7 non-Soviet.

SUBMITTED: August 2ɔ, 1960

Card 4/𝟬

SYUY TSZEN-TSZI [Hsü Tsêng-chi] (Moskva); POLYAKOV, A. Yu. (Moskva);
    SAMARIN, A.M. (Moskva)

    Oxygen solubility in liquid iron-silicon alloys at atmospheric
    pressure and in vacuum. Izv. AN. SSSR. Otd. tekh. nauk. Met.
    i topl. no.2:115-118 Mr-Ap '61.   (MIRA 14:4)
                    (Iron-silicon alloys—Oxgen .content)

22973

S/180/61/000/003/001/012
E111/E135

18.3200

AUTHORS: Okorokov, G.N., Polyakov, A.Yu., and Samarin, A.M.
               (Moscow)

TITLE: Removal of oxygen in arc vacuum remelting of special
               steels

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh
               nauk, Metallurgiya i toplivo, 1961, No.3, pp. 3-9

TEXT: Vacuum arc remelting is now widely used for special
steels and its efficacy has been established by the present
authors (Ref.3: Izv. AN SSSR, OTN, 1958, No.5) and W.W. Dyrkacz
(Ref.1: Iron Age, 1955, v. 176, No.7, and Ref.2: J. Metals, 1957,
v. 9, December).   The authors (Ref.8: Filial VINITI AN SSSR,
Peredovoy proizvodstvennyy i nauchno-tekhnicheskiy opyt, 1959,
No. M-59-270/6) and others have studied technological and
theoretical aspects of the process, but sufficient attention has
not been given to the way in which it eliminates oxygen and oxide
non-metallic inclusions.   Indications (Ref.8) are that the more
favourable vacuum conditions for reaction of metallic oxides are
not due to the carbon. On the basis of results of vacuum arc

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E111/E135

Removal of oxygen in arc vacuum remelting of special steels

remelting of low-carbon iron initially deoxidized with various
deoxidizers or initially not deoxidized, it was proposed that
oxygen in the form of stable non-metallic inclusion could be
removed without participation of the carbon (Ref.8). To check
these results the experiments have been repeated. Ingots from a
12-kg open induction furnace were forged to 40-45 mm diameter rods
and two electrodes from each ingot were prepared. These were
remelted in an arc vacuum furnace with a 75-mm diameter mould, one
of each pair in vacuum (10^{-2} to 10^{-3} mm Hg) and the others in still
argon at 760 mm Hg; silicon, manganese and aluminium were used for
deoxidation. Both procedures were effective in removing oxygen,
vacuum giving the better results (up to 89% removal). The amount
removed was always greatly in excess of the decrease in carbon.
To study the relation between the amount of CO evolved and the
change in carbon and oxygen content through vacuum arc remelting,
the composition and quantity of gas evolved in the remelting of
deoxidized (silicon, aluminium, manganese) and not deoxidized
low-carbon iron was investigated. Pressure change (in the range

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Removal of oxygen in arc vacuum remelting of special steels

10^{-3} to 5×10^{-2} mm Hg) in a constant volume was used to measure the quantity of gas evolved in one minute (assumed independent of pressure). The melting current was 1200 amp, the voltage 21-23 V. The rate of melting of deoxidized iron was 450-400 and of undeoxidized 400-315 g/min. At low gas evolutions all the gas was assumed to be CO. The results are shown in Table 2. In the deoxidized metal the product of dissolved oxygen and carbon changes little on vacuum remelting and remains well above even the atmospheric-pressure equilibrium value. From the melting conditions it appears that flotation (i.e. effects leading to the concentrations of inclusions at or near the surface) must be an important factor. In manganese-deoxidized metal, where the carbon reaction is favoured by inclusions of x FeO. y MnO or MnO on which CO bubbles can nucleate, both factors are important; in undeoxidized metal the carbon reaction is decisive. With undeoxidized metal the boil produced by vacuum remelting makes this more effective than argon remelting. The arrival of metal at the bath in the form of fine droplets and vertical movement of the

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Removal of oxygen in arc vacuum remelting of special steels

crystallization front also contribute to mechanical removal of
inclusions.   It has been shown that repeated arc remelting of
ШХ -15 (ShKh-15) steel (0.0045% O, 0.018 S, 0.38 Mn) reduces the
inclusions greatly and that the effect is not due to increased time
in the molten state (variations represented by different ingot
weights) but by the remelting process itself.   The demonstrated
decisive role of mechanical factors as distinct from the carbon
reaction in vacuum arc remelting of special steels provides a
theoretical justification for applying the method irrespective of
carbon content.   There are 2 figures, 3 tables and 8 references:
3 Soviet and 5 English. The four most recent English language
references read as follows:
Ref.2: W.W. Dyrkacz,   J. Metals, 1957, v. 9, December.
Ref.4: E.W. Johnson, J.T. Hahm, B. Itoh. Arcs in inert
       atmospheres and vacuum, 1956.
Ref.5: H. Gruber. Arcs in inert atmospheres and vacuum, 1956.
Ref.6: H. Gruber.   J. Metals, 1958, v. 10, No.3.
SUBMITTED: May 30, 1960
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22983

18.7530   1555, 1454, 1418

S/180/61/000/003/011/012
E073/E535

AUTHORS: Vertman, A.A. and Samarin, A.M. (Moscow)

TITLE: Viscosity of Liquid Alloys of the System Nickel-
             Aluminium

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh
             nauk, Metallurgiya i toplivo, 1961, No.3, pp.159-160

TEXT: Chemical interactions in liquid solutions are
apparently an indication of the strong bond in solid solutions
and permit determining the form in which an alloying component
is present.   From this point of view it is of interest to
investigate nickel-aluminium alloys which form the basis of numerous
important high temperature alloys. With the exception of a paper
by V. N. Yeremenko, V. I. Inzhenko and Yu. V. Naydich (Ref.1:
Izv. AN SSSR, OTN, Metallurgiya i toplivo, 1961, No.3) the authors
are not aware of any other published work on the subject. Nickel-
aluminium alloys were smelted in a high frequency vacuum furnace
with a residual pressure of 10^{-4} mm Hg, using 99.9% purity nickel
and high purity aluminium. The viscosity was determined by means
of a viscosity meter, described earlier, in a pure helium atmosphere
which was passed through activated carbon at the boiling
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Viscosity of Liquid Alloys of the ...   S/180/61/000/003/011/012
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temperature of liquid nitrogen. The viscosity was calculated
according to the method of Shvidkovskiy; the obtained results on
the kinematic viscosity of liquid NiAl alloys in the temperature
range 1600-1700°C are presented in a graph. The temperature
dependence of the viscosity in this system is slight and, therefore,
it can be assumed that the viscosity curve applies to the
temperature range 1600-1700°C. The single maximum for the NiAl
composition and the absence of any influence on the viscosity of
the Ni_2Al compound which forms as a result of the peritectic
reaction is of interest. The single maximum on the viscosity
curve shows that the near-order structure characteristic for the
NiAl compound is maintained in the liquid state. Judging from the
value of the maximum on the kinematic viscosity curve the NiAl
dissociates little in the investigated temperature range.
Apparently the chemical interaction in alloys corresponding to
NiAl is so large that these can be considered as stable groupings.
On the other hand, Ni_3Al does not show any influence on the
viscosity of the melt, which is attributed to the presence of a
wide temperature range between the liquidus and the solidus, as

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Viscosity of Liquid Alloys of ...   S/180/61/000/003/011/012
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a result of which the hereditary structure of the solid phase is
not conserved in the formed homogeneous liquid solution. The data
obtained by the authors confirm the results obtained by Yeremenko
in measuring the surface tension (Ref.1). An exception is their
conclusion on partial dissociation of NiAl in the melt. Apparently
it is correct to consider that NiAl is an extremely strong
compound for which the degree of dissociation in the temperature
range under investigation is negligible.   To study the thermal
stability of NiAl in the melt a series of tests were carried out
with levitation melting followed by quenching in a copper mould.
The specimens were in the form of a hollow nickel ampoule with a
threaded-in lid, inside which a stoichiometric quantity of Al was
placed. As a result of heating of the nickel ampoule in the
magnetic field, the aluminium melts.   As soon as the nickel melts
there will be an intensive reaction of combination of Al with Ni
which is accompanied by a sudden rise in the temperature by 300-400°C.
The reaction was made easier by the intermixing of the metal in the
magnetic field.   Apparently the chemical interaction between the
Ni and the Al is so strong that the NiAl forms almost instantaneously
and is very stable in the liquid state up to fairly high temperatures.
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Viscosity of Liquid Alloys of ...   S/180/61/000/003/011/012
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There are 1 figure and 2 Soviet references.

SUBMITTED: March 18, 1961

[Abstractor's Note: This is an almost complete translation.]

Figure

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SAMARIN, A.M.; RUDNEVA, A.V.; ZALESSKAYA, S.V.

Effect of the phase composition of slags on the process of cast iron
gravitation in the reduction smelting of red pulp sinters. Izv.vys.
ucheb.zav.; chern.met. 4 no.6:20-26 '61.   (MIRA 14:6)

1. Institut metallurgii im. A.A.Baykova.
        (Cast iron—Metallurgy)   (Slag)

SAMARIN, A.M. (Moskva); MCHEDLISHVILI, V.A. (Moskva)

 Properties of oxides in iron-chromium alloys. Izv. AN SSSR.
Otd. tekh. nauk. Met. i topl. no.4:50-52 Jl-Ag '61. (MIRA 14:8)
   (Iron-chromium alloys—Metallography)

S/180/61/000/005/001/018
E111/E535

AUTHORS: Averin, V.V. and Samarin, A.M. (Moscow)

TITLE: On the thermodynamics of oxygen in liquid metals and
              alloys

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Otdeleniye
              tekhnicheskikh nauk. Metallurgiya i toplivo,
              no.5, 1961, 3-10

TEXT: The authors point out that oxygen, which is present
in the vast majority of metallurgical processes, has a
deleterious effect on metal properties. The authors have made
previous contributions to the thermodynamics of oxygen in melts
(Ref.3: Sb.Fiziko-khimicheskiye osnovy proizvodstva stali.
Izd-vo AN SSSR, 1960; Ref.5: Ibid, 1961), and in the present work
they analyse conditions leading to delay in the decrease of
oxygen concentration in melts and the appearance of an oxygen-
solubility minimum at a definite deoxidizer-concentration.
Analysis of deoxidation under gas of known composition showed
that the decrease in oxygen content of the melt under the action
of the deoxidizer is due to two simultaneous opposed processes:
a) decrease in the oxidizing potential over the melt,
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On the thermodynamics of oxygen ... $S/180/61/000/005/001/018$
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$P^{\frac{1}{2}}_{O_2}$ compared with the value corresponding to the liquid metal saturated with oxygen, which leads to a decrease in oxygen concentration in the melt; b) increase in bond strength of the oxygen in the melt, leading to an increase in oxygen concentration in the melt compared with the liquid metal (at constant P_{O_2} and T values). In liquid Me-R-O melts the Raoult activity coefficient for oxygen at infinite dilution,

$$\gamma_O = \gamma_O^o \cdot f_o \cdot f_o^R , \qquad (4)$$

where γ_O^o is the Raoult activity coefficient for oxygen at infinite dilution in the Me-O system, f_o the Henry activity coefficient for oxygen at concentrations tending to zero and f_o^R the change in the activity coefficient of oxygen effected by the deoxidizer element. f_o^R represents the ratio of oxygen concentrations in the original metal and in the melt with a definite concentration of the deoxidizer element (P_{O_2} being constant). The interaction parameter ε_o^R is given by:
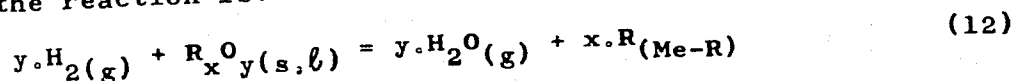
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On the thermodynamics of oxygen ... S/180/61/000/005/001/018
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$$\frac{d \ln P_{O_2}^{1/2}}{dN_R} - \frac{d \ln N_o}{dN_R} = \varepsilon_o^R \qquad (11)$$

where N_o and N_R are the mol fractions of oxygen and deoxidizer, respectively. The authors consider next the reaction of melts with a steam-hydrogen mixture, which is informative both on the solubility and the activity of oxygen. In the general form the reaction is:

$$y \cdot H_{2(g)} + R_x O_{y(s,\ell)} = y \cdot H_2 O_{(g)} + x \cdot R_{(Me-R)} \qquad (12)$$

The equilibrium coefficient:

$$K = \left(\frac{P_{H_2O}}{P_{H_2}}\right)^y \cdot a_R^x = \left(\frac{P_{H_2O}}{P_{H_2}}\right)^y \cdot N_R^x \cdot \gamma_R^x \qquad (12a)$$

where γ_R is the Rauolt activity coefficient for the deoxidizer

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in the system Me-R-O. Taking logarithms and differentiating

$$\frac{d \ln P_{H_2O}/P_{H_2}}{dN_R} = -\frac{x}{y} \cdot \frac{d \ln N_R}{dN_R} = -\frac{x}{y} \cdot \frac{1}{N_R} \quad (14)$$

is obtained, which holds since $K \neq f(N_R)$ and $\gamma_R \sim$ const (for low deoxidizer concentrations). Taking logarithms and differentiating for the equilibrium constant of the gaseous hydrogen + oxygen = water reaction and combining with (14) gives:

$$-\frac{x}{y} \cdot \frac{1}{N_R} - \frac{d \ln N_o}{dN_R} = \varepsilon_o^R \quad (18)$$

Taking x/y values from experimental data on the change in the oxidizing potential of the gas phase in relation to deoxidizer concentration (or approximately from the value in the formula of the oxide of the deoxidizer) and knowing the value of ε_o^R, the

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value of N_R at the minimum oxygen concentration can be found.
The reverse calculation to find ϵ_o^R and $e_o^R = \dfrac{d \ln f_o^R}{d[R]}$ can also be
carried out.   The table shows calculated and experimental values.

Deoxidizer concentration for $[O]_{min}$

Me-R melt	Calculated		Experimental	$-\epsilon_o^R$	$-e_o^R$
	$N_R \times 10$	R, %	R, %		
Fe-Cr	85.00 [2]	8.00	12.0 [9]	8.80	0.041 [2]
	50.00 [10]	4.50	6.0 [11]	13.?0	0.064 [10]
	—	—	9.0 [12]	57.00	0.270 [2]
Fe-V	11.80 [2]	1.10	1.5—2.0	2.30	0.020 [2]
Fe-Si	200.00 [2]	10.00	—	15.00	0.130 [13]
	33.00 [13]	1.60	—	14.40	0.125 [14]
	34.00 [14]	1.70	5.0—7.0 [14]	890.00	8.000 [15]
	0.75 [15]	0.04	0.1—0.2 [15]	6.55	0.030
Fe-Al	153.00	15.00	25.0 [16]	51.00	0.250
Ni-Fe	15.00	1.30	1.5—2.0	80.00	0.400
Ni-Cr	8.40	0.73	0.6—0.7 [6]	97.00	0.450
Ni-V	10.30	0.90	0.5—0.8 [5]	15 00	0.137 [4]
Ni-Mn	33.00 [4]	1.00	5.0 [4]	17.50	0.6086
Ni-Si	43.00	3.80	3.0—4.0		
Co-Cr					

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On the thermodynamics of oxygen ...   S/180/61/000/005/001/018
E111/E535

(The references given in the above table are as follows:
Ref.2: Chipman, J. Atomic interaction in molten alloy steels,
J.Iron and Steel Inst., 1955, June, 97; Ref.4: Sharf G.,
Averin, V.V., Polyakov, A.Yu., Samarin, A.M. Izv.vuzov, Chernaya
metallurgiya, 1958, No.11, 29; Ref.5: Quoted earlier; Ref.6:
Averin, V.V., Cherkasov, P.A., Samarin, A.M. Nauchn. dokl. po
teorii zharoprochnosti. Izd-vo VPA, 1961, p.230; Ref.9:Linchevskiy,
B.V., Samarin, A.M., Izv. AN SSSR, OTN, 1953, No.5; Ref.10:
Turkdogan E.T., J.Iron and Steel Inst., 1954, v.178, p.278;
Ref.11: Hilty D.C., Forgang W.D., Folkman R.L. Oxygen solubility
and oxide phases in the Fe-Cr-O system. J.Metals, 1955, No.2;
Ref.12: Averin, V.V., Samarin A.M. DAN SSSR, 1960, v.120, No.6,
1253; Ref.13: Matoba J. J.Iron and Steel Inst. Japan, 1959, 45,
No.3, 229; Ref.14: Hsü Tseng-Chi, Polyakov, A.Yu., Samarin, A.M.,
Izv.AN SSSR, OTN, Metallurgiya i toplivo, 1961, No.2, 115;
Ref.15: Kuznetsov B.M., Samarin A.M. Sb.Fiziko-khimicheskiy
oxnovy proizvodstva stali. Izd-vo AN SSSR, 1961.)

Next the authors consider the reaction of the water-hydrogen
mixture with the deoxidizer, so as to elucidate how the oxidizing
potential of the gas phase changes with changes in deoxidizing
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                                    E111/E535

activity. Taking the equilibrium constant for Eq.(12) in the logarithmic form and differentiating, and taking into consideration that $K \neq f(a_R)$, we obtain:

$$\frac{d \lg P_{H_2O}/P_{H_2}}{d \lg a_R} = -\frac{x}{y}.$$ (21)

Finally, the following equation is obtained:

$$\frac{y}{x} \cdot \frac{d \lg \frac{P_{H_2O}}{P_{H_2}}}{d \lg N_R} + \frac{d \lg \gamma_R}{d \lg N_R} + 1 = 0$$ (24)

This shows that in $\lg \frac{P_{H_2O}}{P_{H_2}} - \lg N_R$ coordinates, the tangent of

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the curve is determined not only by the ratio of the stoichiometric
coefficients x and y but also on the nature of the change of
the activity of the deoxidizer as a function of the concentration.
Two particular cases are possible for which the results obtained
according to Eqs.(21) and (24) are identical: 1) for small
deoxidizer concentrations γ_R is practically constant and,
consequently, the term $d \lg \gamma_R/d \lg N_R$ of Eq.(24) becomes zero
so that the activity becomes proportional to the concentration

$$a_R = \gamma_R \cdot N_R = \frac{1}{100} \cdot \frac{M}{M_R} \cdot \gamma_R [R] \qquad (25)$$

where M and M_R are respectively the atomic weights of the metal
and the deoxidizer and

$$\frac{d \lg \dfrac{P_{H_2O}}{P_{H_2}}}{d \lg a_R} \doteq \frac{d \lg \dfrac{P_{H_2O}}{P_{H_2}}}{d \lg N_R} = \frac{d \lg \dfrac{P_{H_2O}}{P_{H_2}}}{d \lg [R]} \qquad (26)$$

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In this case all equations expressing the concentration of the
deoxidizer lead to equal results. 2) In the range of high
deoxidizer concentrations $N_R = a_R$ and, accordingly, the derivative
d lg γ_R/d lg N_R = 0. Except for the first two terms, Eq.(26)
holds for only a limited range of concentrations, even in ideal
solutions, due to the fact that the atomic weights differ.
There are 4 figures, 1 table and 16 references: 11 Soviet and
5 non-Soviet. The four latest English-language references read
as follows: Refs.2, 11, 13 (quoted in text) and Ref.16: Wriedt, H.A.
Chipman, J. Oxygen in liquid iron-nickel alloys, Trans. AIME,
1956, v.206, 1195.

SUBMITTED: March 10, 1961

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30081
S/048/61/025/011/027/031
B117/B102

Phase equilibrium in the ...

4 hr (nos. 1-9) and for 1 hr (nos. 10-12). Specimens no. 7 were found to consist of one phase, and specimens nos. 2-6 and nos. 8-20 to consist of two phases. The bright phase in no. 2-6 seemed to be hematite, whereas the dark one appeared to be barium hexaferrite $BaO \cdot 6Fe_2O_3$. The bright phase in nos. 8-20 was barium hexaferrite. The dark one could not be identified and was designated as X-phase. In almost all ferrites, the three phases showed constant hardness throughout the above-mentioned periods of time and at every sintering temperature. The saturation magnetization was examined on specimens of the quasibinary $Fe_2O_3 - BaO$ system after sintering at 1200^0C for 8, 16, 24, and 32 hr. and by grinding them intermittently. The saturation magnetization as a function of composition, was found to have a maximum for specimen no. 7, and dropped linearly on either side of it. This shows that two phases exist in the ranges of 0-14.3% of BaO and 14.3-50% of BaO: a magnetic $(BaO \cdot 6Fe_2O_3)$ and a nonmagnetic phase. It is hematite in the range mentioned first, and evidently $BaO \cdot Fe_2O_3$ in the other. The Curie temperature was measured on the same specimens. In the range of 14.3-50% of BaO the Curie point was

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30081
S/048/61/025/011/027/031
B117/B102

Phase equilibrium in the ...

constant, which is indicative of the heterogeneity of this range. In the range of compositions from no. 7 to 9 the Curie point is lowered, probably due to the presence of a homogeneous region. In the range up to 14.3% of BaO the Curie point was anomalously reduced for specimens nos. 2, 3, and 4, after 16-32 hr of sintering. This is probably a consequence of the change in the composition or in the structure of the ferrimagnetic phase (barium hexaferrite). In specimens nos. 2-6, which were sintered at 1200°C for 24 and 32 hr, heterogeneity was established by means of X-ray structural analysis. The specimens sintered for 24 hr consist of hematite and barium hexaferrite. On an increase of the BaO content in the mixture, the hexaferrite lines become more intense, while the hematite lines turn weaker. In specimens sintered for 32 hr it was established that with increasing BaO content the lattice constant of barium hexaferrite increases on axis a, and drops somewhat on axis c. Changes in lattice parameters are quite insignificant. Still, they exceed the experimental errors; this should not occur in the heterogeneous region of the binary equilibrium diagram. There are 4 figures, 1 table, and 3 references: 1 Soviet and 2 non-Soviet. The reference to the English-language publications reads as follows: Yasumasa Goto, Toshia Takada, J.

Card 3/5

Phase equilibrium in the ...

30081
S/048/61/025/011/027/031
B117/B102

Amer. Ceram. Soc., 43, 150 (1960).

Table: Compositions of examined specimens.
Legend: (1) no. of specimen; (2) molar ratio; (3) mole%, BaO.

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S/020/61/139/006/014/022
B103/B101

AUTHORS: Baratashvili, I. B., Fedotov, V. P., Samarin, A. M.,
            Corresponding Member AS USSR, and Berezhiani, V. M.

TITLE: Solubility of nitrogen in liquid manganese

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 139, no. 6, 1961, 1354-1355

TEXT: Since the data published on the solubility of nitrogen in liquid
manganese are contradictory, the authors studied this problem by the method
of dynamic equilibrium established between liquid manganese and nitrogen
or a nitrogen - hydrogen mixture. The activity of N_2 in the metal
corresponds to the partial pressure of N_2 in the gaseous phase at the
instant of equilibration. The nitrogen content corresponding to the
equilibrium was determined in a specimen of the solid, rapidly cooled
metal. Methods and apparatus were described by A. M. Samarin, V. P.
Fedotov (Tr. IV Konfer. po fiziko-khimicheskim osnovam proizvodstva
stali (Proceedings of the 4th Conference on the Physicochemical
Fundamentals of Steel Production)Izd. AN SSSR, 1960, p. 144). The metal

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Solubility of nitrogen in liquid ...

S/020/61/139/006/014/022
B103/B101

was heated with an ЛГ-60 (LG-60) h-f tube generator. Mn melt was purified with purified hydrogen (400 ml/min) for 1 hr. Subsequently, it was cooled and again molten (Test series I and II). The melt was subjected to the action of N_2 or N_2+H_2 for 120 - 180 min at a given temperature and with a given consumption of H_2 and N_2 (40 and 1100 ml/min, respectively) (series I). In the second series, the treatment was performed within 30, 60, 90, and 120 min. In the third series, Mn with a nitrogen content of 3.3 and 6.0% was treated as stated above but without previous purification in H_2.

The nitrogen content of Mn was chemically determined. It is noted that equilibrium at the same temperature is attained both by saturating the Mn melt with nitrogen and by denitrifying the nitrogen-containing Mn. Keeping the manganese in the gas current for 1 hr is sufficient for reaching equilibrium. The solubility of nitrogen decreases with increasing temperature. This function is given by $1/2 \ N_{2(g)} \rightleftharpoons [\% \ N]$, $K = a_N / P_{N_2}^{1/2}$

$= f_N [\% \ N] / P_{N_2}^{1/2}$ (1). As a standard state, an Mn melt is taken, which is in

Card 2/3

Solubility of nitrogen in liquid ...   S/020/61/139/006/014/022
B103/B101

equilibrium with N_2 having a pressure of 1 atm. According to experimental data, the following relations are obtained for P_{N_2} = 1 atm and f_N = 1:

$$\log K = \log[\% N] = 3010/T - 1.457; \quad (2);$$

$$\Delta F^o = - 13,780 + 6.65\ T \quad (3).$$

There are 2 figures and 6 references: 3 Soviet and 3 non-Soviet.

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR (Institute of Metallurgy imeni A. A. Baykov, Academy of Sciences USSR)

SUBMITTED: April 29, 1961

Card 3/3

S/020/61/140/002/022/023
B130/B110

AUTHORS: Baratashvili, I. B., Fedotov, V. P., Samarin, A. M., and
              Berezhiani, V. M., Corresponding Member AS USSR

TITLE: Solubility of nitrogen in manganese-iron and manganese-
              silicon melts

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 140, no. 2, 1961, 423-425

TEXT: The solubility of nitrogen and nitrogen-hydrogen mixtures in Mn-Fe
and Mn-Si melts is calculated by the method of dynamic equilibrium between
melt and gaseous phase. Apparatus and method were the same as indicated
by A. M. Samarin, V. P. Fedotov (Tr. IV Konfer. po fiziko-khimicheskim
osnovam proizvodstva stali, Izd. AN SSSR, 1960, p. 144). The Fe and Si
content changed during melting by 2-3%. Results of determination of the
solubility of nitrogen are given in Figs. 1 and 2. From the experimental
data, the dependence of the coefficient of nitrogen activity in Mn-Fe and
Mn-Si melts on the Fe and Si concentration in the melts is given:

$$a_N^{Mn} = f_N'[\%N]_{Mn}, \quad a_N^{Mn-Si(Fe)} = f_N[\%N]_{Mn-Si(Fe)}$$ (a).

Card 1/2

Solubility of nitrogen ...   S/020/61/140/002/022/023
                                                             B130/B110

Thus, at constant pressure and constant temperature under equilibrium
conditions,

$$a_N^{Mn} = a_N^{Mn-Si(Fe)}, \quad f_N'[\%N]_{Mn} = f_N'[\%N]_{Mn-Si(Fe)} \qquad (b).$$

The solubility of nitrogen in liquid Mn at p_{N_2} = 1 atm and T = const is

taken as standard. Then, $f_N' = 1$ and $f_N = \dfrac{[\%N]_{Mn}}{[\%N]_{Mn-Si(Fe)}}$.(1). Si causes

a stronger decrease of N solubility than Fe. Also an increase in the
temperature of the melt reduces the N solubility (Fig. 4). log K and ΔF^0
were calculated from the experimental data given in Fig. 4. Calculation
results are given in Table 1. There are 4 figures, 1 table, and 3 Soviet
references.

ASSOCIATION: Institut Metallurgii im. A. A. Baykova Akademii nauk SSSR
               (Institute of Metallurgy imeni A. A. Baykov of the Academy
               of Sciences USSR)

SUBMITTED: May 11, 1961
Card 2/6

SAMARIN, A.M., otv. red.; RYKALIN, N.N., otv. red.; ZOLOTOV, P.F.,
red. izd-va; SUSHKOVA, L.A., tekhn. red.

[Steel made of Kerch Peninsula ores] Stal' iz kerchenskikh rud.
Moskva, Izd-vo Akad. nauk SSSR, 1962. 90 p.   (MIRA 15:6)

1. Akademiya nauk SSSR. Institut metallurgii. 2. Chlen-
korrespondent Akademii nauk SSSR (for Samarin, Rykalin).
                    (Steel—Metallurgy)
                    (Kerch Peninsula—Iron ores)

GAYUI, Rene Zhyust [Hauy, Rene-Just]; SHAFRANOVSKIY, I.I., prof.;
ZABOTKINA, O.S.[translator]; STRATANOVSKIY, G.A.[translator];
SHUBNIKOV, A.V., akademik, red.; BOKIY, G.B., red.;
PETROVSKIY, I.G., akademik, red.; ANDREYEV, N.N., akademik, red.;
KAZANSKIY, B.A., akademik, red.; YUDIN, P.F., akademik, red.;
DELONE, B.N., red.; SAMARIN, A.M., red.; ZUBOV, V.P., prof.,red;
LEBEDEV, D.M., prof., red.; FIGUROVSKIY, N.A., prof., red.;
KUZNETSOV, I.V., kand. filos. nauk, red.; OZNOBISHIN, D.V.,kand.
istor. nauk, red.; SUSHKOVA, T.I., red. izd-va; SMIRNOVA, A.V.,
tekhn. red.

[Structure of crystals; selected works] Struktura kristallov;
izbrannye trudy. Sostavlenie, stat'ia i primechaniia I.I.
Shafranovskogo. Redaktsiia A.V.Shubnikova i G.B.Bokiia. Mo-
skva, Izd-vo Akad. nauk SSSR, 1962. 175 p. Translated from the
French.   (MIRA 15:3)
1. Chlen-korrespondent Akademii nauk SSSR (for Bokiy, Delone,
Samarin).
                        (Crystallography)

SAMARIN, A.M., red.; PTITSYNA, V.I., red. izd-va; DOBUZHINSKAYA, L.V.,
    tekhn. red.

[Vacuum metallurgy]Vakuumnaia metallurgiia. Moskva, Metallurgiz-
dat, 1962. 515 p.   (MIRA 15:12)

1. Chlen-korrespondent Akademii nauk SSSR (for Samarin)
                 (Vacuum metallurgy)

SAMARIN, A.M.

Principal directions in the expansion of the technology of ferrous
metal production. Izv. AN SSSR. Otd. tekh. nauk. Met. i topl.
no.2:3-8 Mr-Ap '62.   (MIRA 15:4)
              (Iron--Metallurgy) (Steel--Metallurgy)

BURTSEV, V.T. (Moskva); KARASEV, R.A. (Moskva); SAMARIN, A.M. (Moskva)

Sulfur vapor pressure in contact with iron - sulfur melts. Izv.
AN SSSR. Otd. tekh. nauk. Met. i topl. no.2:42-48 Mr-Ap '62.
(MIRA 15:4)
(Vapor pressure—Measurement) (Desulfuration)

GARNYK, G.A.; SAMARIN, A.M.

    Effect of certain elements on the properties of electrical
    engineering steel. Elektrichestvo no.2:71-74 F '62. (MIRA 15:2)

    1. Institut metallurgii im. Baykova.
                                (Steel)

GOAN' AN'-MIN' (Moskva); MCHEDLISHVILI, V.A. (Moskva); SAMARIN, A.M. (Moskva)

Process of steel deoxidation by complex alloys of silicon, manganese, and aluminum. Izv.AN SSSR. Otd.tekh.nauk. Met.i topl. no.4:31-39 Jl-Ag '62. (MIRA 15:8)
(Steel—Metallurgy)

S/148/62/000/005/001/009
E071/E135

AUTHORS: Vertman, A.A., Mchedlishvili, V.A., and Samarin, A.M.

TITLE: The influence of deoxidation on the viscosity of molten iron

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Chernaya metallurgiya, no.5, 1962, 34-36

TEXT: The effect of deoxidation of steel by a deoxidising element depends to a considerable extent on the velocity of flotation of products of the deoxidising reaction. Since there are no direct methods of measuring the velocity of flotation of non-metallic inclusions from a liquid metal, the authors attempted to evaluate this velocity from results of changes in the kinematic viscosity of liquid iron during its deoxidation with silicon and aluminium. The viscosity was determined from the torsional vibrations of a cylinder filled with the liquid investigated. The experiments were carried out at 1600 °C with additions of 0.1 and 1.0% Si and 0.5 and 1.0% Al to armco iron, in an atmosphere of purified helium in a furnace with graphite heating elements, so as to exclude the possibility of reoxidation.
Card 1/2

The influence of deoxidation on ...   S/148/62/000/005/001/009
E071/E135

In all the experiments addition of the deoxidant resulted first
in an increase of the viscosity, due to heterogenisation of the
liquid metal caused by the formation of deoxidation products;
this was followed by a steady decrease in viscosity which
approached its initial value for pure iron. The time taken to
reach the initial viscosity after the addition of a deoxidant can
serve as a measure of the velocity of flotation of deoxidation
products. The duration of flotation of products formed on the
addition of 0.5 and 1% Al was 2-3 minutes. On adding 0.1% Al the
velocity of flotation decreased considerably: the initial
viscosity was not attained after a considerable time (25 minutes).
Addition of 1% Si had a similar effect; on adding 0.1% Si the
velocity of flotation is considerable, after about five minutes
the deoxidation products were removed. This confirms that the
deoxidation with large quantities of aluminium is more effective
than deoxidation with silicon or small additions of aluminium.
There are 2 figures.
ASSOCIATION: Institut metallurgii AN SSSR
Card 2/2   (Institute of Metallurgy, AS USSR)
SUBMITTED: October 4, 1961

S/659/62/009/000/028/030
I003/I203

AUTHORS   Averin, V. V., Cherkasov, O. A., and Samarin, A. M.

TITLE: Deoxidation of molten nickel

SOURCE   Akademiya nauk SSSR. Institut metallurgii. Issledovaniya po zharoprochnym splavam.
            v. 9. 1962. Materialy Nauchnoy sessii po zharoprochnym splavam (1961 g.),205–218

TEXT: Nickel-base heat-resisting alloys are widely used in the jet plane, and rocket industry. The influence of deoxidizing elements such as iron, cobalt, chromium, manganese, vanadium, titanium, silicon, carbon, and aluminum on both the solubility and on the activity of oxygen in molten nickel was investigated. It was also shown that the activity of these elements is actually lower in nickel than in iron, which is in good agreement with the values for the heat of formation of intermetallic compounds of the type Ni_xR_y and Fe_xR_y. A comparison was made between the influence of the above deoxidizing agent on the activity of oxygen in molten nickel and in molten iron. A relationship between the decrease in activity of oxygen and its minimum solubility was found. In the discussion, A. V. Emyashev pointed out that the total oxygen content in nickel does not determine its properties, as about 80% of the oxygen is bound in the form of oxides, and it is the non-metallic inclusions which must be taken into account. There are 5 figures and 3 tables.

Card 1/1

BURTSEV, V.T.; KARASEV, R.A.; POBEGAYLO, V.M.; SAMARIN, A.M.; KHLEBNIKOV, A.Ye.

    Desulfuration of liquid iron in vacuum. Izv. vys. ucheb. zav.;
    chern. met. 5 no.5:86-93 '62.   (MIRA 15:6)

    1. Institut metallurgii im. Baykova.
        (Iron-metallurgy)   (Desulfuration)

YASKEVICH, A.A.; SAMARIN, A.M.

Effect of nitrogen and boron on the properties of austenitic
stainless steel. Izv. vys. ucheb. zav.; chern. met. 5 no.7:
97-102 '62.   (MIRA 15:8)

1. Moskovskiy institut stali i splavov.
                    (Steel, Stainless—Metallurgy)

S/032/62/028/010/003/009
B117/B186

AUTHORS: Burtsev, V. T., and Samarin, A. M.

TITLE: Investigation of saturated vapor pressures of liquid metals and their impurities by the carrier gas technique

PERIODICAL: Zavodskaya laboratoriya, v. 28, no. 10, 1962, 1199-1203

TEXT: The accuracy of the carrier gas technique for determining the pressures of saturated metal vapors above 10^{-2} mm Hg is checked. It is shown that errors are caused by variations in the velocity of the carrier gas, vapor condensation, holding time, and extrapolation of the results. Determination of saturated silver vapor at 1150 and 1250°C using argon shows that the maximum total error of this technique is ~7 %. Comparison between experimental results and published data (J. Elliott, M. Gleiser, Thermochemistry for Steelmaking, Addison-Wesley Publishing Co., London (1961)) shows a divergence of 2 to 3 %. Data on iron vapor determined at 1580-1680°C differed from reference values by 2.5-3%. Determination of the partial pressure of saturated sulfur vapor above iron-sulfur melts (sulfur content, 0.067-0.57 %) indicates that the sulfur escaping from

Card 1/2

S/030/62/000/002/002/008
B105/B110

AUTHOR: Samarin, A. M., Corresponding Member AS USSR

TITLE: Research into the physical and chemical fundamentals of metallurgical techniques

PERIODICAL: Akademiya nauk SSSR. Vestnik, no. 2, 1962, 35 - 37

TEXT: The author gives a brief report of new scientific studies that serve the perfection of techniques of obtaining metals from natural raw materials, of metal and alloy refining, of increasing the quality of the products and of improving the commercial and economic indices. In this connection oxygen and natural gas are mentioned as new means. The author mentions the production of ultra pure metals and alloys and the improvement of the steel and alloy properties, the production of super-strength steels and alloys with special properties for machine constructions and apparatus operating at high and superhigh temperatures and pressures or at high speeds. He discusses the necessity of processing combines and agglomerating plants in order to increase the furnace capacity. Special emphasis is laid upon the industrial use of low and superhigh pressures

Card 1/2

Research into the physical ...

S/030/62/000/002/002/008
B105/B110

and of atmosphere with low oxidation potential: vacuum treatment of liquid
steel, casting of steel and alloys in the vacuum or in an inert-gas atmos-
phere. melting and casting of steel and alloys in vacuum furnaces; produc-
tion of metals and iron alloys by reducing the oxides and other metal com-
pounds in the vacuum, decarbonization of metals and alloys in the vacuum,
decomposition of various compounds and evaporation of impurities in the
vacuum. The most important task is considered to be the determination of
the thermodynamic functions of metallurgical reactions and the study of
the kinetics of these reactions, the determination of the effect of surface
energy in steel melting, the prevention of interaction between metal and
vacuum furnace lining. To perfect the technique of continuous casting and
rolling, it is necessary to study the structures of metallic melts, to de-
termine methods of changing them, and to introduce optimum methods of order-
ing the crystalline structure of steel and alloys.

Card 2/2

S/020/62/143/001/027/030
B101/B147

AUTHORS: Mchedlishvili, V. A., Samarin, A. M., Corresponding Member
              AS USSR

TITLE: Oxide inclusions in iron - vanadium alloys

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 143, no. 1, 1962,
              159 - 161

TEXT: The authors studied deoxidation products forming in liquid
electrolytic iron on the addition of vanadium of 0.064, 0.13, 0.18, 0.25,
and 0.85%. V was added in the form of ferrovanadium. Samples taken
between 1560 and 1580° C were electrolytically dissolved, and the anodic
deposit was studied microscopically and radiographically. Results: (1) On
increasing the V content to 0.18%, the shape of oxide inclusions changes
from irregular and globular to clearly rhombic and octahedral forms.
At 0.25% V, only rhombic and rectangular forms were observed. (2) The
particles are highly magnetic at <0.25% V, and nonmagnetic at >0.25% V.
The radiographic lines of these two groups differ. (3) Calculations of

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Oxide inclusions ...

S/020/62/143/001/027/030
B101/B147

interplanar spacings showed the structure of inclusions with $<0.25\%$ V to be that of vanadium spinel, FeV_2O_4, with isomorphic substitution of V : $Fe^{2+}(Fe^{3+}, V^{3+})_2O_4$. At a very low V content, the structure of the inclusions is similar to that of Fe_3O_4 which explains their magnetic properties. At $>0.25\%$ V, the structure of inclusions is almost identical with that of V_2O_3. There are 1 figure, 1 table, and 2 references: 1 Soviet and 1 non-Soviet. The reference to the English-language publication reads as follows: Cumulative Alphabetical and Grouped Numerical Index of X-Ray Diffraction, Philadelphia, 1953.

SUBMITTED: November 18, 1961

Card 2/2

VOLKOV, S.Ye. (Moskva); SAMARIN, A.M. (Moskva)

Effect of the silicon reduction of steel on the process of its
desulfuration. Izv. AN SSSR. Otd. tekh. nauk. Met. i topl. no.3:
20-26 My-Je '62.   (MIRA 15:6)
          (Steel—Metallurgy)   (Desulfuration)

S/180/62/000/006/001/022
E193/E383

AUTHORS: Vertman, A.A., Samarin, A.M. and Filippov, Ye.S.
            (Moscow)

TITLE: Viscosity and electrical conductivity of liquid
            nickel-carbon alloys

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Metallurgiya i toplivo,
            tekhnicheskikh nauk.
            no. 6, 1962, 37 - 42

TEXT: In continuation of an earlier work (Izv. AN SSSR, OTN,
Metallurgiya i toplivo, 1960, no. 6, 162-167) the authors have
determined the concentration-dependence of viscosity and elec-
trical conductivity of liquid nickel-carbon alloys in the 0-2.3%
carbon range. The results are reproduced in Fig. 4, where the
viscosity (ν, centistokes) and electrical resistivity (ρ, $\mu\Omega\,cm$)
of the alloys at temperatures indicated by each curve are plotted
against the carbon content (C, wt.%) of the alloy. Since it had
been shown earlier (V.M. Glazov, A.A. Vertman - Sb. Stroyeniye i
svoystv zhidkikh metallov (Symposium. Structure and properties
of liquid metals), Izd-vo AN SSSR, 1960, 124-137) that the vis-
cosity isotherms of eutectiferous systems passed through a
Card 1/4

S/180/62/000/006/001/022
E193/E383

Viscosity and ....

minimum at the eutectic composition (i.e. in the alloy in which
the relatively weaker forces binding dissimilar atoms predominated)
the curves reproduced in Fig. 4 indicated that the Ni-C eutectic
was formed at 1.35% against the published value of 2.0-2.5% C. The
constitution diagram of the Ni-C system was therefore reinvestigated
by thermal and metallographic analysis; the results showed that
the eutectic was, in fact, formed at approximately 1.3-1.4% C.
It was concluded, consequently, that the minima on the viscosity
and electrical-resistivity isotherms were associated with the fact
that the short-range order, inherent in solid eutectic alloys was
retained on melting; increasing the concentration of either Ni
or C in the alloy brought about an increase in the proportion of
the relatively stronger forces between similar atoms which, in
turn, increased the viscosity of the alloy. The existence of
viscosity hysteresis was also established. This effect was
attributed to the existence of microscopic arrays of C atoms in
the alloy; these dissolved partially on melting, as a result of
which their size during subsequent cooling was smaller than during
heating, this difference being reflected in the viscosity of the
alloy. The presence of a sharp minimum in the concentration-

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S/180/62/000/006/001/022
E193/E383

dependence of the activation energy for the viscous flow of Ni-C
alloys was also attributed to the effect of microscopic arrays of
C atoms. The concentration-dependence of the ρ_{*}/ρ_{TB} ratio
(where ρ_{*} and ρ_{TB} denote, respectively, resistivity of the
alloy in the liquid and solid states at the eutectic temperature)
was also determined. The value of ρ_{*}/ρ_{TB}, practically constant
in the hypo-eutectic alloys, increased sharply in the hyper-
eutectic range. This effect was attributed to partial dissolution
of the carbon micro-arrays on melting. The general conclusion was
that the formation of carbon micro-arrays was a property common
to all three systems of the Ni-C system which represent a limiting
case of microheterogeneous eutectic alloys with properties
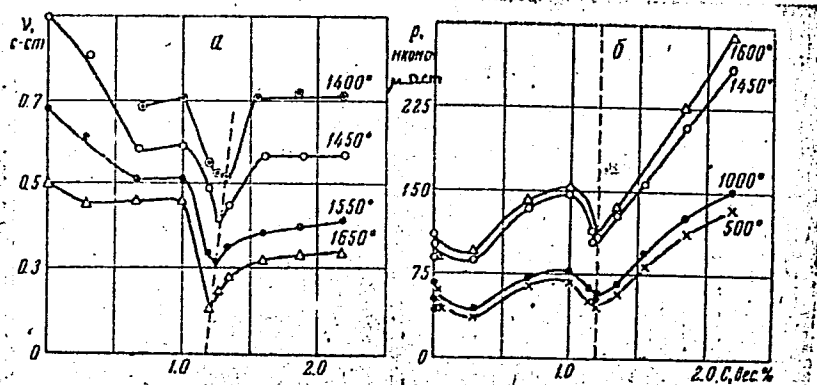approaching those of a colloidal solution. There are 7 figures.

SUBMITTED: May 8, 1962

Card 3/4

Viscosity and ....

Fig. 4:

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VERTMAN, A.A.; SAMARIN, A.M.

Structure and properties of liquid metals. Trudy Inst.met.
no.10:108-134 '62.   (MIRA 15:8)
        (Liquid metals—Testing)

VERTMAN, A.A.; SAMARIN, A.M.

  Physicochemical properties of liquid alloys of iron, nickel,
  and cobalt. Trudy Inst.met. no.10:135-151 '62.   (MIRA 15:8)
    (Liquid metals—Testing)   (Alloys—Testing)

VERTMAN, A.A.; SAMARIN, A.M.

      Separation of liquid eutectics by centrifugation. Trudy Inst.
      met. no.10:152-154 '62.   (MIRA 15:8)
               (Eutectics)   (Centrifugation)

S/509/62/000/010/001/005
I003/I242

AUTHORS: Pupynin, V.P., Hsü Tseng-chi, Polyakov, A. Yu, and Samarin, A.M.

TITLE: Investigation of the activity of the components in molten binary alloys of the nickel-carbon system

SOURCE: Akademiya nauk SSSR. Institut Metallurgii. Trudy, no. 10. Moscow, 1962, 155-161. Metallurgiya, metallovedeniye, fiziko-khimicheskiye metody issledovaniya

TEXT: The investigation of the thermodynamic properties of molten nickel alloys is not only of theoretical interest: it serves to determine the optimum composition and the best process for the

Card 1/2

S/509/62/000/010/005/005
I003/I203

AUTHORS: Yang Nan-tsu, Makunin, M.S., Polyakov, A.Yu.,
                and Samarin, A.M.

TITLE: Investigation of the vacuum preparation of ferrova-
                nadium and ferrotungsten

SOURCE: Akademiya nauk SSSR. Institut metallurgii. Trudy,
                no. 10. Moscow, 1962, 246-251. Metallurgiya,
                metallovedeniye, fiziko-khimicheskiye metody
                issledovaniya

TEXT: The reduction of vanadium pentoxide in vacuum is
less expensive than the present USSR process of reduction by
ferrosilicon and aluminum in an electric furnace. The kinetics

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S/509/62/000/010/005/005
I003/I203

Investigation of the....

of the process of reduction of mixtures of vanadium and iron oxides by carbon was studied at pressures from 10^{-3} to 200 mm Hg and at temperatures of 600 to 1300°C. The process is very economical and yields purer products than envisaged by Soviet ГОСТ (GOST) standards. Briquettes of ferrotungsten obtained in an analogous process at a temperature of 1100°C and at a pressure of 0.1 mm Hg have an insufficient mechanical strength and therefore re-briquetting and sintering at 1350°-1400° in vacuum is necessary. There are 4 figures and 2 tables.

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AGRIKOLA, Georgiy [Agricola, Georg]; GAL'MINAS, V.A.[translator];
        DROBINSKIY, A.I.[translator]; SHUKHARDIN, S.V., red.;
        PETROVSKIY, I.G., akademik, red.; ANDREYEV, N.N., akademik,
        red.; KAZANSKIY, B.A., akademik, red.; YUDIN, P.F., akademik,
        red.; DELONE, B.N., red.; SAMARIN, A.M., red.; ZUBOV, V.P.,
        prof., red.; LEBEDEV, D.M., prof., red.; FIGUROVSKIY, N.A.,
        prof., red.; KUZNETSOV, I.V., doktor filos. nauk, red.;
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[Mining and metallurgy; in twelve books]O gornom dele i metal-
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Akad. nauk SSSR, 1962. 597 p.   (MIRA 15:8)

1. Chlen-korrespondent Akademii nauk SSSR (for Delone, Samarin).
            (Mines and mineral resources)
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KASIN, V., SAMARIN, A.M.

"Die entschwefelung von flussigem nickel im vakuum."

Report submitted to the 14th Congress on Mining and Metallurgy,
Freiberg, GBR   13-16 June 1962

PHASE I BOOK EXPLOITATION   SOV/6270

Samarin, A. M., ed., Corresponding Member, Academy of Sciences USSR.

Vakuumnaya metallurgiya (Vacuum Metallurgy). Moscow, Metallurgizdat,
    1962. 515 p. Errata slip inserted. 3200 copies printed.

Ed. of Publishing House: V. I. Ptitsyna; Tech. Ed.: L. V. Dobuzhin-
    skaya.

PURPOSE: This book is intended for engineering personnel of metal-
    lurgical and machine-building plants, scientific research workers
    and teachers, and aspirants and students at schools of higher
    technical education.

COVERAGE: Thermoydnamic fundamentals of vacuum application in various
    metallurgical processes and problems of melting in vacuum induction
    and arc furnaces are discussed. Procedures of casting large ingots
    and vacuum degassing of steel in ladles are described, along with
    designs of metallurgical vacuum equipment. Problems connected with
    the use of mechanical and steam-ejector vacuum pumps, and with the

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Vacuum Metallurgy   SOV/6270

    designing, calculation, and operation of vacuum systems, are re-
    viewed in detail, along with vacuum-measuring techniques. No
    personalities are mentioned. Each article is accompanied by ref-
    erences, mostly Soviet.

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